

Question:

1. *How many atoms does 2.0 moles of He represent?*
2. *How many sodium ions are in 3.0 moles of NaCl?*
3. *How many molecules are in 0.25 moles of CH₄?*
4. *How many total atoms are in 1.0 moles of H₂O?*

Answer:

1. How many atoms does 2.0 moles of He represent?

We use the following formula to calculate the number of atoms:

$$n(\text{mol}) = N(\text{number of atoms}) / N_A$$

$$N(\text{He}) = n(\text{mol}) \cdot N_A$$

$$N(\text{He}) = 2,0 \text{ moles} \cdot 6.02 \cdot 10^{23} = \mathbf{12.04 \cdot 10^{23} \text{ atoms}}$$

2. How many sodium ions are in 3.0 moles of NaCl?

$$n(\text{mol}) = N(\text{number of ions}) / N_A$$

1 molecule of NaCl contains 1 sodium ion (Na⁺), that's why if we have 3.0 moles of NaCl, we have 3.0 moles of Na⁺.

$$N(\text{ions}) = n(\text{mol}) \cdot N_A$$

$$N(\text{ions}) = 3.0 \text{ moles} \cdot 6.02 \cdot 10^{23} = \mathbf{18.06 \cdot 10^{23} \text{ ions}}$$

3. How many molecules are in 0.25 moles of CH₄?

$$n(\text{mol}) = N(\text{number of molecules}) / N_A$$

$$N(\text{molecules}) = n(\text{mol}) \cdot N_A$$

$$N(\text{molecules}) = 0.25 \text{ moles} \cdot 6.02 \cdot 10^{23} = \mathbf{1.505 \cdot 10^{23} \text{ molecules}}$$

4. How many total atoms are in 1.0 moles of H₂O?

1 molecule of H₂O contains 3 atoms (two hydrogen & one oxygen), that's why if we have 1.0 moles of H₂O, we have 3.0 moles of atoms.

$$N(\text{atoms}) = n(\text{mol}) \cdot N_A$$

$$N(\text{atoms}) = 3.0 \text{ moles} \cdot 6.02 \cdot 10^{23} = \mathbf{18.06 \cdot 10^{23} \text{ atoms}}$$